

Environment  
Ontario

# legacy

Vol. 10, No. 4

February-March 1982

## \$45,000 Environment Ontario funding

## Pitch-In '82 to last a full week

Environment Ontario is endorsing and supporting the Ontario Federation of Anglers and Hunters in its drive to enlist thousands of Ontario municipalities, schools and outdoor interest groups to join Ontario's second major outdoor environmental action project, Pitch-In '82. Environment Minister Keith Norton announced.

Set to take place May 10-16, the

event is sponsored by the OFAH in co-operation with Shell Canada Ltd. The ministry has made a \$45,000 grant to provide organizational assistance and promotion material.

"Pitching in need not be expensive or time consuming," Mr. Norton said in announcing the provincial grant for Pitch-In support. "All it requires is a sincere desire

to improve the environment.''

A total of 7,500 invitations and information kits are being sent to organizations and schools across Ontario to promote the event. Shell Canada has donated hundreds of thousands of large garbage bags to schools, community groups and individuals who are planning to join the activity.

Ontario's first Pitch-In campaign, held in 1980, saw more than 50,000 volunteers picking up an estimated 200 tons of garbage out of the landscape on June 7, 1980. Doug Ogston, president of the

OFAH, was delighted with the willingness and excitement the campaign generated. "It was a terrific first effort by all volunteers," he said. "They felt great about their part in helping to keep Ontario beautiful. It was encouraging to see that so many people really care about the environment — even the toddlers helped."

This time the federation will try to involve more schools, service clubs and a larger number of communities. In the 1980 campaign, the volunteers gained valuable ex-

perience that will help to make the 1982 campaign even more successful.

"The thousands of vacationers that will seek recreation in our great Ontario landscape, and the many tourists we can expect during the summer months, will find clean, well-kept sites all across the province and will be encouraged to come back and visit again," Mr. Norton said. "But, more importantly, the communal effort will encourage everybody involved to be more careful with the disposal of garbage in the future."

## Women pilots win international award

The first Canadian Chapter of the Ninety-Nine Inc. (Toronto-Buttonville) was recognized internationally with a Diploma of Honor for its contribution to education, charitable works and science by the Federation Aéronautique Internationale. A contributing factor to the award is the involvement of the chapter's members in Skywatch, Environment Ontario's aerial surveillance program.

In this program the women pilots volunteer their time and aircraft operation costs to fly En-

Environment Ontario experts in aerial photography and environmental investigation on reconnaissance flights. The flights are conducted in close co-operation with Environment Ontario's regional offices in Toronto, Hamilton, London and Ottawa.

The Ninety-Nines Inc. is an international organization of women pilots founded by Amelia Earhart in 1929. It derives its name from the number of founding members.

For a report of the Ninety-Nines activities in co-operation with Environment Ontario see pages 6, 7.

## Bio-lab opened in Guelph



Ross Stevenson (left), parliamentary assistant to Environment Minister Keith Norton, and Lorne C. Henderson, minister of agriculture and food, release control insects that will debug an infected

cabbage plant at the official opening of the biological test control laboratory at the University of Guelph.

(photo: Robert Koci)

## \$70 million grants for municipalities

Grants with a total value of nearly \$70 million will be available to several Ontario municipalities for sewage and water treatment projects, Environment Minister Keith Norton announced.

Of this amount, \$65 million will be provided over three years for sewage treatment projects in communities in the Great Lakes Basin by Environment Canada under the Canada-Ontario Agreement. The funds will be administered by Environment Ontario.

An additional \$4.6 million in special funding was approved by the Ontario Cabinet to supplement existing provincial assistance for municipal water and sewage treatment projects adversely affected by the termination of the federal-provincial Community Services Contribution Program.

"The special provincial assistance, together with the Great Lakes program, will ensure that municipalities throughout the province receive sufficient funding to complete much-needed sewage and water facilities," Mr. Norton said.

In providing its \$65 million grant, Canada is fulfilling its obligations under the Canada-United States Great Lakes Water Quality Agreement. The most recent of the federal programs designed to meet these obligations, the CSCP, was terminated by Ottawa in November, 1980. At that time many Great Lakes communities had not yet completed their sewage treatment projects.

(continued on pg. 2)

Almost all cases against polluters brought before Ontario courts in the fiscal year 1980/81 have been decided and have resulted in convictions, reports Neil Mulvaney, director of Environment Ontario's legal services branch.

In total, 43 industrial, commercial, agricultural, private and municipal organizations were charged under the Environmental Protection Act, the Ontario Water

Resources Act or under the Pesticides Act. All charges were dismissed in only one case, one case was withdrawn, in one case the judge pronounced a suspended sentence and in another case a judicial decision is still pending. The dismissed case is now under appeal.

In the remaining 39 cases the judges imposed fines ranging from \$50 to \$22,000. The majority of

finer lay in the \$1,000- to \$1,500-range.

During the fiscal year 1981/82 31 charges were laid between April 1, 1981 and November 10, 1981. Of these 14 cases have been concluded.

The figures do not include minor prosecutions under Part VII of the Environmental Protection Act, concerning private sewage disposal such as septic tanks, etc.

LEG

brarian

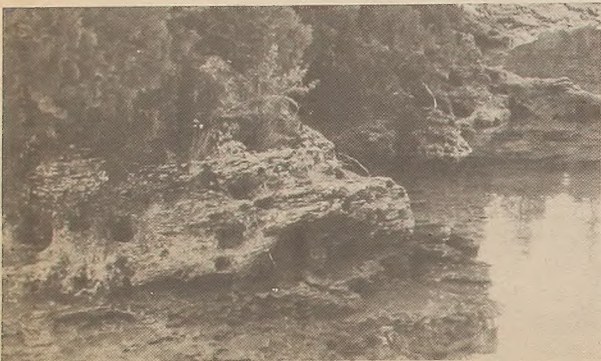
Main Library  
 University of Toronto  
 Toronto, Ontario M5S 1A1

POSTMASTER: IF ADDRESSEE HAS MOVED, DO NOT FORWARD BUT RETURN TO ABOVE ADDRESS WITH PRESENT ADDRESS IF KNOWN



**It's all one world...**

## Development kills Caribbean coral reefs



Some 50 million years ago corals were active in Ontario. The photo was taken on Cove Island, one of the ancient coral islands that now separate Georgian Bay from Lake Huron. (photo: Robert Koci)

Coral reefs, the most complex of all marine ecosystems, are deteriorating all over the world, most notably in the Caribbean. The causes of this deterioration are widely varied forms of pollution caused by extensive development and a heavy flow of tourists.

Until quite recently, few people were scattered along shores protected by coral reefs. Although this population subsisted mainly on fish caught on the reefs, the impact of their activity was minimal.

In recent decades, however, many of the areas have been developed and densely populated industrial centres with oil refineries, sewage treatment plants and other related facilities contribute to a steady deterioration of the sensitive coral reef ecosystem.

In addition, ocean currents tend to carry pesticides, heavy metals, herbicides and silt from the Amazon, Orinoco and Mississippi rivers into the Caribbean Sea. Dredging required in many places to provide access of large tankers and other commercial ships to the new centres, stir up sediments that reduce the amount of sunlight

many microorganisms inhabiting the reef need to survive.

Such activity, together with heavy siltation, tends to destroy the basic links of the ecological chain on which all life on coral reefs depends.

To control this deterioration, the nations rimming the Caribbean have established, together with the United Nations Environmental Program, a plan to control this pollution.

The plan calls for expenditures of about \$8.2 million over the next three years, but the chances that this money may be provided seem to be slim.

The 135 million people of the Caribbean form 29 political entities of a widely diversified nature — independent states, overseas departments, associated states, commonwealths and colonies. Population densities and resources endowments also vary widely.

Even a modest conservation program would call for the political and financial co-operation of all the entities involved, and to achieve this in today's political climate appears to be impossible.

## The Elbe has tough problems

The flow of waste into Germany's second largest river, the Elbe, is larger than the flow from all but three of the river's many tributaries, reports New Scientist.

Attempts to clean up this major carrier of pollution into the North Sea run into a great obstacle: the three countries through which the river runs, Czechoslovakia, East Germany and West Germany, do not talk much to each other.

The river's main pollutants are heavy metals. Concentrations of 30 parts per million of mercury and 400 ppm of cadmium have been found in dried river sludge.

West German authorities claim that most of the pollution originates in Czechoslovakia and East Germany, through which the river flows before entering West Germany. To do its share in cleaning up the amount of pollutants discharged into the North Sea, the City of Hamburg at the river's mouth is building two sewage treatment plants at a cost of about \$200 million.

For West German industrial plants, a system of fees has been

introduced for the discharge of wastes into the river. The fees will increase substantially from year to year to induce industry to build its

own purification plants. Permission to dump 20 grams of mercury, for example, costs about \$6 this year and will cost \$20 in 1986.

## 'Valley of Drums not bad'

The hazards of the Valley of the Drums, a widely publicized abandoned chemical dump site in Kentucky, have been overestimated by the press, Geraldine Cox, vice-president of the Chemical Manufacturers Association of the U.S., said.

A closer look showed that one half of the drums were empty and many of the second half contained solids.

Of the number of hazardous waste sites, often reported as 30,000 to 50,000, there are 239 sites of real concern in the U.S., Mrs. Cox said.

The U.S. Environmental Protection Agency has released a priority list of 114 abandoned dump sites that are eligible for federal aid. The greatest number of sites in any one state, 16, has been found in Florida, followed by New Jersey with 12.

tion system before it reaches the water taps in homes, offices and factories.

In some areas system losses are monitored, and here the losses amount on the average to 6.1 litres per property per hour. In areas not equipped with monitoring devices, the losses reach 18.6 litres per property per hour.

## Stoves and cancer

Burning of wood and coal in Pioneer Valley, Massachusetts, raises the level of cancer-causing polycyclic compounds in the air, report researchers at the University of Massachusetts. A jogger on a crisp morning will inhale 1,300 to 1,500 more hydrocarbons in a neighborhood heated with wood stoves than in one heated with natural gas.

## Detector listens to watermain leaks

Leaks in watermains can be detected easily by a microelectronic device demonstrated at a conference of water engineers in England.

The simple device "listens" to such leaks and converts the noise into electric signals that locate the source at a distance of up to 250 metres with an accuracy of 0.5 metre.

## Britain's rivers slide back

In the present financial climate there appears to be no prospect of resources available for a continuation of Britain's 20-year-old campaign to clean up polluted rivers, the chairman of Britain's National Water Council said.

Since 1970 the length of grossly polluted rivers dropped by half following high investment in the early and mid-seventies. Capital spending on the task has been cut by 50 per cent and now ageing sewage treatment works and greater complexity of trade effluents are making rivers dirtier. In the past five years 46 km of rivers have slid back into the grossly polluted category. More than 1,300 km of unpolluted rivers have become "doubtful".

The prospect for improvements in the still existing 1,034 km of grossly polluted and 2,220 km of poor rivers is bleak.

London at Stansted has already generated nearly 1,200 documents in 13 weeks of hearings. During these 13 weeks, only evidence by the proponents has been heard. The evidence of the opponents to the plan and the consideration of alternative sites is still to come and the inquiry is expected to last until autumn of 1982.

The first Stansted inquiry, held in 1960, lasted only nine weeks and resulted in a rejection of the plans.

Several hundred protesters attended the start of the new inquiry — but after 13 weeks, the 500-seat hall in which the enquiry is held is practically empty.

## PCB disposal banned

The land disposal of PCBs, pesticides, toxic metals, cyanides, halogenated organics and volatile organics has been banned in California starting in January, 1983. The state is also committed to the construction of advanced waste treatment facilities.

## Inquiry interests lapses

An environmental inquiry into the British Airports Authority's plan to build a third airport for



Ministry  
of the  
Environment

Ontario

Published bi-monthly by the Ministry of the Environment, Information Services Branch, 135 St. Clair Avenue West, Toronto, Ontario, M4V 1P5 for those interested in the many facets of environmental enhancement. Reproduction of articles authorized without further permission. Second Class Mail Registration Number 4168

Editor ..... Robert Koci

Director of Information Services ..... R.J. Frewin

## Grants...

(continued from pg. 1)

Under the new grant program, criteria for determining the level of grant, administration and payment procedures will remain unchanged. Funds are limited to projects which have reached an advanced state of development and are confined to Great Lakes Basin communities with water pollution problems.

Since Canada and the U.S. signed the Agreements on Great Lakes water quality in 1972, \$1.4 billion has been spent by all three government levels on sewage treatment facilities in Ontario municipalities bordering the Great Lakes.

## Good water disappears

About 24 per cent of the water entering a distribution system never gets to the customer, reports the technical committee of the British National Water Council. In some areas, as in South Wales and West Cumbria, the loss of water reaches 50 per cent. Only a small share of this water is lost through burst water-mains and similar accidents. Most of it simply disappears through thousands of small leaks in the thousands of branches and miles of piping of the distribu-



## Niagara River:

# Waste loadings a long-term concern

The Niagara River is a continuous source of numerous metals and organic compounds to Lake Ontario, concludes the "Environmental Base Report of the Niagara River, November 1981, Update," recently tabled by Environment Minister Keith Norton in the Ontario Legislature.

The report was prepared jointly by the staff of Environment Ontario and Environment Canada under the Canada Ontario Agreement on Great Lakes Water Quality.

"Based on my Ministry's monitoring and testing programs, treated water serving Niagara-on-the-Lake, Niagara Falls and Fort Erie meet federal and provincial criteria for drinking water," Mr. Norton said. "The water supplies for these communities remain safe, and this report confirms it."

"However I continue to be concerned about the potential long-term effects of the loading of metals and organic contaminants from U.S. sources at existing levels."

The data, published in the report, corroborate in general the findings reported previously. Yearly average water quality conditions on the Niagara River over the period 1975-1980 met the 1978 Canada-U.S. Great Lakes Water Quality Agreement water quality objectives. Concentrations of some organics and metals exceeded these objectives in less than 10 per cent of the samples analyzed. The concentrations of most organics were non-detectable in water. For heavy metals, only iron and copper concentrations exceeded the objectives consistently over this period.

## numerous compounds

Concentrations of many parameters including iron, manganese, zinc and mercury were consistently higher on the U.S. side of the upper river. Distribution of contaminants was uniform across the lower Niagara River, due to strong lateral mixing in the section from the falls to the power plant tailrace. Water supplies serving Niagara-on-the-Lake, Niagara Falls (Canada) and Fort Erie met existing and proposed Canadian and Ontario objectives for drinking water. These supplies also compared favorably with suggested limits for several other organics not presently dealt with in the existing drinking water objectives.

Analyses of suspended sediment, bottom sediment and fish indicated the presence of numerous organic compounds in the Niagara River system. Specifically, all bottom sediment samples from the lower Niagara River and the majority of samples from the Buffalo River and Tonawanda Channel areas of the upper Niagara River had concentrations of PCBs exceeding 50 ppb — the MOE criterion for confined disposal of dredged spoils.

The major portion of the loading of PCBs and some pesticides oc-

curs adjacent to and downstream from Grand Island, New York. The Love Canal and Buffalo River areas are also sources of numerous organics to the river. The estimated annual loading of suspended sediment associated PCBs to Lake Ontario (based on data collected at Niagara-on-the-Lake in 1979) is approximately 530 kg/yr.

A large percentage of bottom sediment samples from the slower moving sections of the lower Niagara exceeded the MOE dredge spoil criteria for a number of trace metals indicating that the river section downstream of Queenston is an accumulation area for contaminated sediments.

## reasons for DDT increase unknown

Comparison of analyses of suspended sediments from Niagara-on-the-Lake with those taken at a control station at Thunder Bay in Lake Erie indicate that many of the compounds detected in the lower Niagara River are not detectable in Lake Erie. This indicates that there are continuing intermittent inputs of these compounds to the river itself.

Parent DDT constituted a higher percentage of the total DDT (and metabolites) in spottail shiner fish taken from Niagara-on-the-Lake than those caught in other areas of the river. This parallels an increase in the concentration of parent compound DDT in suspended sediments collected in the same area. The reason for this increase is unknown since DDT has been restricted to use by permit only in Ontario since 1969 and only in medical emergencies in New York State. The possible sources of this pesticide are under further investigation.

PCB and alpha-BHC concentrations in 1980 spottail shiner samples collected at Niagara-on-the-Lake were higher than those from 1979, although not higher than those observed in 1978. Results of the 1981 samples were yet available.

Various size ranges of coho salmon and American eel caught in 1980 in the Lower Niagara River were fit for only "occasional consumption" due to levels of PCBs and mirex. 2, 3, 7, 8 — TCDD (dioxin) was not detected by Environment Ontario in fillets of several species of fish from the upper and lower sections of the river. However, recent U.S. Fish and Wildlife data on two samples indicate detectable levels of this compound in whole fish. Yellow perch from both the upper and lower parts of the river were within the guidelines for PCBs, mirex and mercury.

A number of previously undetected peaks representing as-yet unidentified halogenated organic compounds were observed in the analyses of suspended sediment samples collected from the Niagara River at Niagara-on-the-Lake. Detection of these peaks has been possible because of the use of new analytical methods. At least 21 of



The part of the Niagara River below the falls is the area with most problems. The plume of the effluent from the Niagara Falls, N.Y., sewage treatment plant is visible in the middle right. (photo: Ron Johnson)

the peaks detected in suspended sediment were also detected in Niagara River fish (spottail shiners). These peaks were not detected in fish caught at other locations in Lake Ontario.

Preliminary analysis of the data from a survey of 19 industrial and municipal discharges entering the Niagara River or tributaries to the river indicated that Ontario sources contribute generally less than 1 per cent of the estimated trace metals and organics loadings to the river.

## more than 300 industrial plants

Twelve discharges have been selected for follow-up sampling.

The magnitude of point and non-point sources differs on the two sides of the Niagara River. On the U.S. side, 12 municipal wastewater treatment plants and 89 industrial facilities are reportedly licensed by New York State to discharge their effluent to the Niagara River (or its immediate tributaries). Over 300 other industrial operations discharge indirectly to the river via municipal wastewater treatment plants, eliminating the need for individual permit requirements.

Very little data are as yet available on trace contaminant inputs from the New York State

shoreline. However, loading information from the City of Niagara Falls, N.Y. sewage treatment plant indicates it to be a larger contributor to the trace organics load in the Niagara River than all Ontario point sources combined.

Results of a U.S.E.P.A. May 1981 survey of 10 municipal and industrial discharges suspected of being major contributors of heavy metals and/or organics, when available, should better define the loading picture. A 1979 New York State report identified 215 chemical waste dumps (non-point sources) in the Niagara/Erie county area.

Of these, at least four are known to have leaked contaminants into the river (Love Canal, Hyde Park, 102nd Street, Hooker "S" Area) and were rated as priority 1. In contrast to New York State, there are 3 municipal disposal sites on

## largest tributary to Lake Ontario

the Ontario side of the river. Total effluent flow from all U.S. point sources to the Niagara River, at 1,500,000 cubic metres per day, is over six times that from all Canadian sources (236,000 cubic metres per day).

The Niagara River is the single largest tributary to Lake Ontario. In some cases, conditions in the lake can be directly related to

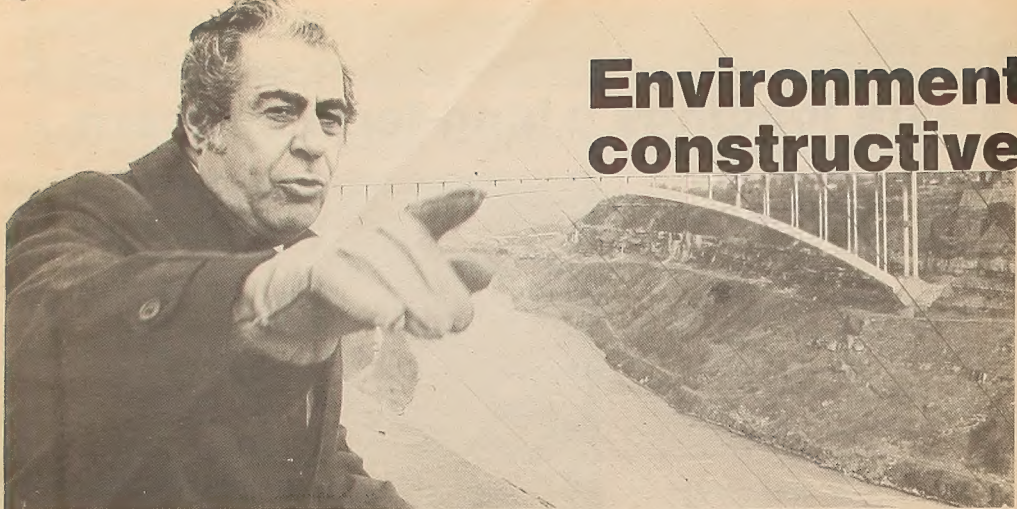
the Niagara River as the predominant or single point source input. Contamination of Lake Ontario fish by mirex and dioxin illustrate the point.

The Niagara River (specifically U.S. sources to the river) has been identified as the major source of mirex to Lake Ontario. Concentrations of this compound in several species of Lake Ontario sport fish resulted in health advisories on both the Canadian and U.S. side and a total ban on possession of several species of fish being issued by the N.Y. Department of Environmental Conservation.

Several species of fish caught in the lower Niagara River are still only suitable for "occasional consumption" due to mirex contamination. The 1980 report indicated that no detectable levels of any TCDD isomers were observed in herring gull eggs from the Niagara River. In December 1980, Environment Canada published more recent data identifying the detection of dioxin (2, 3, 7, 8 — TCDD) in herring gull eggs taken from Lake Ontario (and Lake Michigan).

The data indicated a decline in levels in Lake Ontario since 1971. Dioxin has also been detected by Environment Ontario in some Lake Ontario sport fish samples at levels below the human consumption limit of 20 ppb in most samples. In the case of Lake Ontario, a U.S. source of dioxin in the Niagara River is again suspected.





Vince Kerrio was involved in the preparation work for the construction of the Queenston Bridge.

## Kerrio: "I want to participate"

Vince Kerrio, MPP, represents Niagara Falls. He is a native of the area and has also spent a good part of his business life building a wide variety of projects on and in the Niagara River.

He designed and built the marine railway that hauls the "Maid of the Mist" sightseeing boats out for winter storage; he built the observation platform at the Great Gorge and the Marina at Niagara-on-the-Lake. He was involved in the preparation for the site for the construction of the Lewiston Bridge, installed current-measuring devices along the Niagara River and completed many similar construction jobs along the river shores.

### sailed on Great Lakes

He is also a sailor, commodore of a local sailing club, and has sailed on three of the Great Lakes.

"I still remember when commercial fishermen operated specially-built nets near the Niagara River mouth and caught sturgeon of up to 100 pounds," he said, "and when we could catch blue pickerel off the Queenston docks."

"You won't find these species of fish in Lake Ontario anymore, and this and other observations prompt me to follow my deep-rooted concern for our environment in the Legislature."

"I hope that I can participate not only in the cleanup, but also in assuring in some way that no chemical enters the market before it is properly tested — all the way from the start of its production to its ultimate disposal."

"I also hope to see a major change in recycling and in the advanced treatment of industrial waste to prevent minuscule amounts of deadly chemicals polluting millions of cubic yards of lake water."

"I am sure other jurisdictions in North America and in Europe had to cope with similar problems, and we should take a better look at the methods they are using to treat industrial waste."

Mr. Kerrio is well aware of the "not-in-my-backyard" syndrome that has slowed down past attempts to handle industrial wastes. He feels, however, that it should be possible to regain the public's trust, "although Environment Ontario has made some bad mistakes in this area in the past."

Before being appointed environmental critic, Mr. Kerrio participated as a private citizen in hearings dealing with waste disposal problems in New York State.

"Our interventions on the other side of the border made quite an impression, and I hope that Environment Ontario, too, will become more involved in New York State waste disposal problems in a similar way it intervenes in the U.S. for the control of emissions causing acid rain. I am quite sure the Americans would do the same if we polluted their water or their air," Mr. Kerrio said.

### intervention is new ball game

"This intervention procedure is a whole new ball game and the Ministry seems to have learned a lot from this acid rain intervention in U.S. courts, tribunals and on various panels."

"As far as the waters of the Niagara River are concerned, such interventions can be based on the Boundary Waters Act of 1909, and government should use this well-established tool to clean up the river."

"If the Ministry believes that it does not have the staff to pursue this matter, all it has to do is to support such organizations as Op-

eration Clean by providing them with technical information and some financial help."

"In view of the management record of SCA Chemical Waste Services on the U.S. side, I would really like to see some arrangement between the private sector and government and industrial waste management — as we have done in the Ontario Waste Management

### OWMC — the way to go

Corporation. That is definitely the way to go."

"Within our own borders, I would like to see the rule that the polluter pay enforced more effectively. It was established two ministers ago, and not very much has been heard about it since."

"Properly pursued, this guideline would give the government a new tool for environmental control — the economic incentive. In some areas in Europe, pollution charges to polluting industries have been applied since the early 1930s."

There are also economic gains to be achieved by a stricter control of industry, Mr. Kerrio believes. Government experts from the Ministries of the Environment and Industry and Tourism, in co-operation with industry and universities, should establish a technology centre for the development of new and effective pollution abatement equipment.

### new industry: control equipment

"There is a growing and world-wide demand for such equipment, and such a centre would not only help to solve our problems, but would also provide employment and exports."

# Environment constructive

Mr. Kerrio likes action. When he wanted to sail, he built his own boat. When he wanted to learn to fly, he built his own aircraft. He carries the same thirst for action over to his job as environmental critic.

"I always feel that I should go beyond mere criticism," he said. "I think I have the added obligation to point out constructive ways to deal with a problem, to show the Minister areas in which we could be helpful, to direct him to new methods."

"We have, for example, in Ontario the best sewage and water treatment system I know, probably one of the best in North America. The system has reached a point at which well over 90 per cent of the

"If we present our side of the problem to the media in a cold, factual way, we get very little or no response," he said. "Sometimes we must play the alarmist, just to get the fires going."

A good example was Pollution Probe's report on Toronto's drinking water. "What the report was saying," Mr. Kerrio said, "was that we may be doing a wonderful job with the removal of bacteria and viruses, but not necessarily with the removal of toxic chemicals from our drinking water. We will have to watch this and the trend of concentrations of these materials because ten years from now it may be too late."

### ...if acid lakes would turn red...

The Ministry is doing a great job, Mr. Kerrio readily admits, in its approaches to the solution of the acid rain problem.

"The difficulty is that we don't really have anything spectacular to help us to convince the people south of the border. If acid lakes would turn a bloody red we could create much more excitement about the problem."

### ...we must keep trying...

"As it does not happen, and in view of the new attitude of the Reagan administration toward the environment, we must keep trying to find sound scientific evidence that acid rain does indeed have an impact on our forests and our agriculture."

Mr. Kerrio realizes fully that the protection of the environment is not an easy task, and he would like to contribute to the best of his ability.

"One day, looking back, I, too, would like to be able to say that I have had, in my way, an impact on the restoration of our Ontario environment," he said.

### a common problem: media handling

population enjoys water and sewage treatment. And the Ministry is still spending about 85 per cent of its budget on this part of its job."

"Would it not be time to spend less in this area and free some funds for other major problems, such as industrial waste and acid rain? Would it not be possible to improve the economics of the existing treatment system?"

It bothers Mr. Kerrio that in Ontario communities, of large amounts of water treated, only a small amount is actually consumed by people.

"The major part of this very clean water is used to flush our toilets, to wash our cars and our laundry, after which it has to be treated again at considerable expense before it is returned where it came from. Could we not find a way to avoid double-treatment?"

One of the problems Mr. Kerrio shares with government agencies is contact with news media.



# critics aim for opposition

by Robert Koci

photos: Tessa Buchan

Lively criticism is an essential part of political life in Ontario. To illuminate the role criticism plays at Queen's Park, the environmental critics of the opposition parties in the Ontario Legislature were interviewed by Robert Koci, the editor of *Legacy*.

The driving force of both critics, Vince Kerrio (Liberal) and Brian Charlton (NDP), is their concern about our environment. Both feel that constructive criticism helps Environment Ontario and its Minister fulfill their mandate to protect the province's environment.

## Charlton is concerned with timing

Brian Charlton, MPP, has lived for the past 25 years on "The Mountain" from which he and the voters, who elected him can look down onto that cauldron of heavy industry, Hamilton. They can even see the city on a day when a strong wind blows smoke from the stacks out onto Lake Ontario.

He admits that the environment has not always been his key interest. But he was interested and had been involved as a politician with various environmental issues: Hamilton Harbor, for example, the "Beach Strip", the Upper Ottawa Street landfill.

### not as brave as George Kerr

The first ten years of his life he spent at the foot of the Niagara Escarpment. He remembers that his mother used to swim in Hamilton Harbor.

"In those times people probably did not know how polluted the harbor was," he said. "Today you can really see how dirty the water is, the foam floating on it. My father used to fish in the harbor. There are no fish there today."

I am also not as brave as George Kerr, who swam in the harbor when he was environment minister. But I would like to be able to, some day.

The environment is not Mr. Charlton's only portfolio. He is also his party's revenue critic. The combination is a result of the party's loss of seats during the last election, and partly due to Mr. Charlton's interest.

Although revenue is a large field, he finds the time and energy to deal with environmental matters. He was involved in several acid rain discussions, and wrote major articles on the subject.

Environment Ontario does many things well in its aim to protect the province's environment.

My concern is mainly with the timing of the Ministry's measures and with the way the Ministry is providing information to the public," Mr. Charlton said.

"I believe firmly that democracy does not work well without public knowledge."

He would like to see this principle applied even though many environmental problems are complex and serious scientists cannot agree on solutions.

The public does not need a full technical understanding of the cause of the problem, or whether the damage the problem causes is temporary or permanent. What is important for the public to know is the impact of the pollution on the environment, what different scientists are saying, even if they are not in agreement.

In my opinion, the public has not been given anywhere near enough information on issues like the Niagara River, the pollution of Lake Ontario, and the acid rain question.

### information equals pressure

"The more information the public has, the more pressure it can put on its elected officials, and compel them to do what the public feels is necessary."

The acid rain issue is a good example. The present and the previous environment minister both said that they were committed to a cleanup of the problem, but their efforts get bogged down in political matter, in spending issues, in international relations, and in speed with which things happen is appalling."

Mr. Charlton cites another example — the effort of an environmental group to combine all the information on the acidification of lakes in the Timiskaming area.

"The group received information from Environment Ontario, from Environment Canada, from the Ministry of Natural Resources, and they superimposed all the information to come up with a comprehensive and up-to-date situation report," Mr. Charlton said. "And they found that the information they got from Environment Ontario was accurate, but out of date."

On the basis of this incomplete information, the conclusion could be reached that the Inco problem should be cleaned up, but that there

### for better public hearing

is still some time — while, in reality, there was no time left."

Public participation groups can only approach their problems on the basis of the information they get. And to allow them to assemble the most up-to-date information, they need financial support, Mr. Charlton maintains.

I spoke recently to Environment Minister Keith Norton about the amounts of money his Ministry is spending on commercial TV advertising," Mr. Charlton said. "The 15- and 30-second clips did not really tell the public much of anything. The money would have been much better spent on the development of educational TV programs on environmental problems."

The educational TV people always have major time slots available for which they lack material. With a bit of co-programming we could see major productions on environmental subjects.

And commercial channels occasionally pick up materials and ideas from educational TV to spread to their viewers."

Mr. Charlton says that criticism alone is not his principal aim.

"The opposition has to play a constructive role," he said. "I cannot afford to spend my time questioning the sincerity of the Minister. I think he is sincere, as are most of the people working in the Ministry, because that is where their interests lie."

Where we have to be critical is when on some issue it looks as if the Ministry has not done its job properly, or where it has withheld information.

I was recently involved in a discussion with Minister Norton and Vince Kerrio on the installation of scrubbers at the new facilities in Atikokan. Minister Norton's attitude was that there was only so much money available, and that the Atikokan facilities were technically far more advanced than existing ones. They would also be built in such a manner that scrubbers could be easily installed if the need became apparent.

I agree with the Minister's position. We can indeed spend the money better by installing scrubbers in existing plants where they

### public needs assistance

are needed than in the least polluting Atikokan plant."

But if the Minister does not live up to his promise to clean up the existing plants, that's when he gets into an argument with me."

Another subject close to Mr. Charlton's heart is public hearings.

The government has set up a number of processes designed to involve the public under the Environmental Assessment Act and

the Environmental Protection Act. Now it becomes apparent that the processes involved are lengthy and costly.

"They could be far less expensive and cumbersome if the Ministry would assist the public in its collection of information. Many groups concerned about projects enter the hearing process cold — without information and without experience. They will spend much time just questioning and drag the process out for days and months. The whole process would become

### shorter and simpler process

much shorter and simpler if the public was well informed."

Such an availability of information could also help to overcome the "not-in-my-backyard" syndrome, Mr. Charlton believes.

There were many totally opposed groups involved in the hearings on the Upper Ottawa Street and the Landbrook landfills," he said. "When the matter was settled and the dump was approved, some were still opposed. But as a result of the hearings, the opposition had diminished dramatically, and that only because a large segment of the public had become well informed during the hearings."

There will always be somebody who says 'No' no matter what. But when the public learns by participating in hearings that the proposal discussed is in their best interest, what controls and what restrictions are imposed, much of the fears are alleviated and much of the opposition melts away."

The next public hearing on an environmental matter that may be required in the same area will then be much easier, faster and simpler.

(continued on pg. 10)



Brian Charlton would like to be able to swim in Hamilton Bay, sometime in the future...





# Fighting pollution from the air

Carol Papas stops at the blackboard in the Buttonville airport building and reads:

O8Z C90 BKN RISK X

Translated into normal English, it means that at noon the bottom of the clouds may be found at an altitude of 9,000 feet, the cloud cover is broken, and there is a risk of rain. It also means that the weather, although not the best, is quite suitable to take the single-engine, four-seater Cessna 172 up and to do a photo and reconnaissance flight for the Ministry of the Environment.

Carol is a member of the 99s — the club of flying women founded by Amelia Earhart, one of the most famous women pilots in North America. Members of the Toronto,

London and Ottawa branches of the club all have volunteered to help Environment Ontario to fight pollution from the air.

That means that pilot time and aircraft time is available to the ministry free. All it has to provide are film, cameras and know-how.

"Flying has become for many of us a form of addiction," explained Carol when asked why members are so generous. "Once you have your ticket — the private pilot's license — you just have to go flying. And if you can combine your desire to fly with a service that benefits the community, all the better."

While Carol files her flight plan, Ron Johnson, Environment Ontario aerial photographer, checks his camera equipment. It is not enough just to see things from the air. If they are recorded on film they may serve as evidence that may stand up in court.

In most cases, court proceedings aren't even necessary. A series of good aerial photos will convince the polluter that appropriate action will cost him less than lawyer and court fees.

When the 99s started to fly for Environment Ontario normal 35mm cameras were used, and in many cases still are appropriate for the task. But the initial success of the operation soon persuaded the ministry to provide better equipment — a high resolution 4in. x 5in. aerial camera with motor drive and stereo capability. The camera produces large color transparencies that show much more detail than can be seen by the naked eye.

After the usual pre-flight check, Carol taxis the Cessna to the runway. When she gets take-off clearance from the tower, she lines the Cessna up and takes off. At about 1,500 feet she levels off, puts the

aircraft on the previously established course and settles down to the routine of flying.

Once at cruising altitude, pilot and observer see the world from a new angle, an angle that is very different from the two-dimensional view possible from ground level.

They can see the land below to its full extent, the size and shape of fields, stands of forest, the course of the smallest gully, little lakes and ponds nobody knows exist, except perhaps the owner of the land.

Changes in the color of water, patches or swaths of off-color foliage on fields or in forests, hid-

## the objective: a landfill

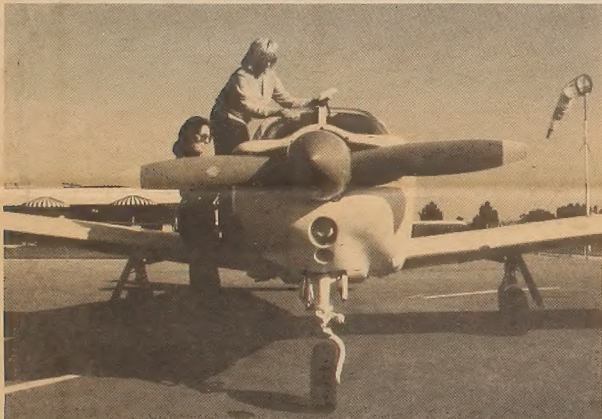
den dumps, burns, and other features of the landscape, practically invisible from ground level, stand out clearly. Some of the changes may be caused by natural events, others may be man-made. Once detected, they can be singled out for a later, closer-look.

The objective of the flight is a landfill site north of Toronto — and after about half an hour the site becomes visible right on the flight path of the aircraft — a light brown patch of earth surrounded by lush green vegetation.

At first sight the operation seems to be in good shape, but first signs may be misleading.

Ron signals to Carol that he would like to take a closer look. Carol descends to about 1,000 feet and circles the site.

While they circle, Ron takes a series of shots. He knows that the camera sees much more and much better than he can. Later stereo evaluation of the film and exami-



Shirley Allen and Adele Vogel, two members of the 99s, prepare their low-wing Piper for a reconnaissance flight.

(photos, Ron Johnson)



99s Betty Innes (right) and Heather Sifton check their course on a flight for Environment Ontario's central region.



The aerial photo of an air-polluting accidental industrial fire shows th



nation under a microscope will reveal many details.

The photo will also serve as a permanent record of the conditions at the time of observation. It will show the equipment used on the site, the distribution of the soil cover, the number of people working at the time, and other information.

The finished photos will be sent to the ministry's regional office where they will be compared with previous photos taken of the site, and with records taken during inspections. The comparison will then allow a full evaluation of the operation.

After some 10 minutes of circling, Ron signals to Carol that he has all the photos he wants. Carol climbs to cruising altitude and sets her course for home.

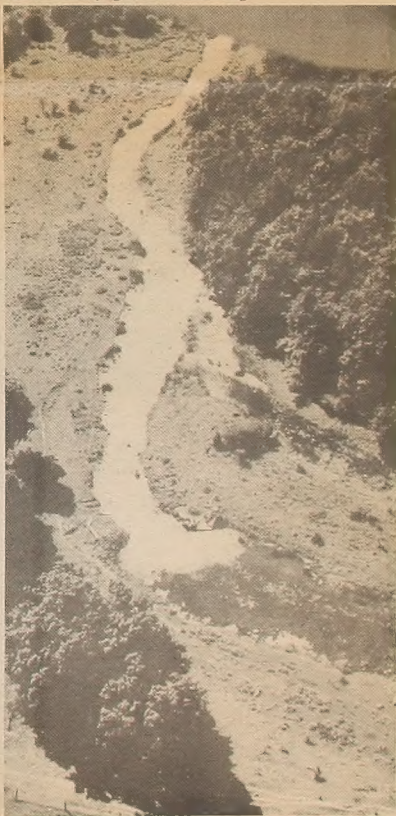
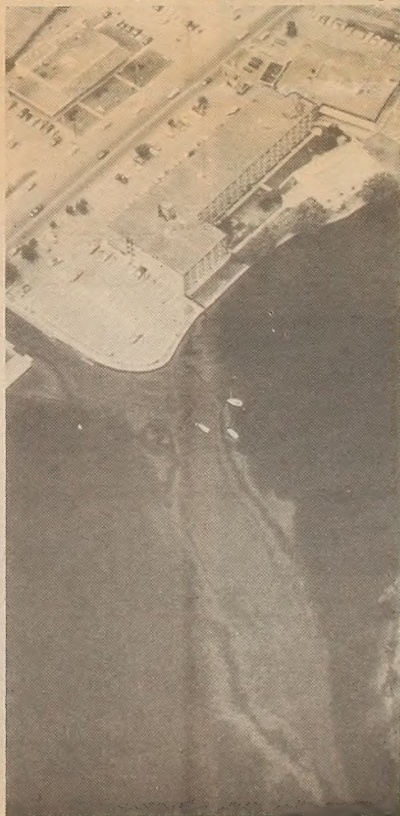
During the 1981 season, 99s flew close to 100 missions for Environment Ontario's regional offices. Some of them were simple reconnaissance flights, others served to verify and photograph reported stack emissions or spills — but all of them provided information that could not be obtained as easily by any other means.

On some of the flights the aircraft carried members of the ministry's special investigation unit, established to take a closer look at sites on which industrial wastes may have been dumped and at other unusual forms of pollution.

In part, the search of SIU investigators is based on the experiences gained during previous aerial observations. Truck tracks ending in an open field, sudden changes in the color of a stream, a patch of wilting foliage surrounded by lush vegetation, and other such signs clearly visible from above may indicate the need for a ground-level follow-up and further investigation.



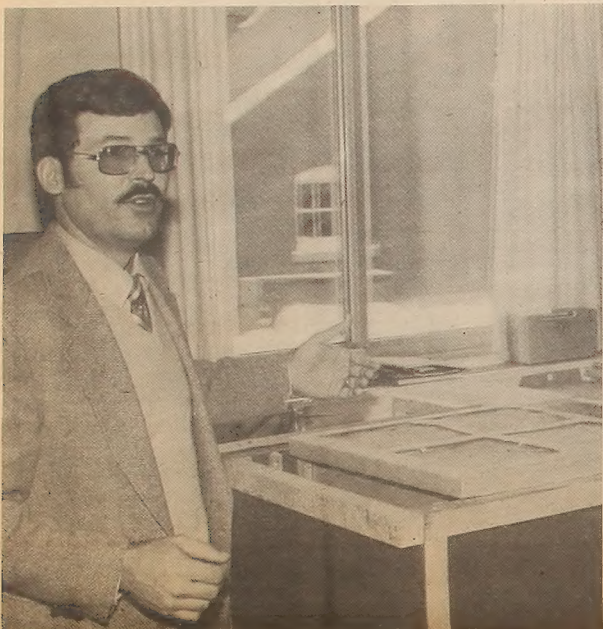
High resolution aerial photo of this liquid industrial waste storage site allows inventorying and close monitoring.



An oil spill in the Trent Canal in Peterborough and a color change in a stream caused by human activity are revealed by aerial photo.



# Lab breeds insects to fight insects



Professor John Laing explains the equipment used to breed a tiny wasp that attacks spruce budworm.



Millions of such pupae will be spread by aircraft over areas affected by onion maggot flies.

Everyone's pocketbook and 30 per cent of all Ontario crops are affected by damage and destruction caused by pests. To find more effective ways to control these pests, the University of Guelph has added, with financial help from the Ontario Ministries of the Environment and of Agriculture and Food, a unique biological control laboratory to its Department of Environmental Biology.

The new laboratory, under the direction of Professor John Laing, is designed to research and develop new ways to control insect pests. It will at the same time provide alternatives to the use of chemicals in pest control.

Chemical pest control has gained widespread use in agriculture since World War II, but this development has had serious consequences. It has caused in many instances severe damage to the environment, and it led to the development of resistant insect strains.

Biological control involves the use of the pest's natural enemies — parasites, predators and natural diseases. Its effects can be limited to a specific species of insects while other species and the environment remain unaffected.

Among the projects initiated in the new laboratory, three major studies employ various techniques of biological control.

One project involves the rearing of sterile male onion maggot flies for mass release over Ontario's Holland Marsh. The onion maggot can destroy the crop, valued at \$15 million annually.

Researchers raise the onion maggot flies to the pupal stage. When several million pupae have been reared, they are sterilized by exposure to a Cobalt 60 source.

Released over the onion field, the sterile males will mate with wild females, but the mating will not produce offspring. This approach will reduce the maggot population drastically. Producers now spend half a million dollars annually on pesticides.

Another technique employed at the lab is the inundation of areas affected by the pests with the pests' natural enemies. In this project, re-

searchers are rearing a tiny wasp that attacks the eggs of insects, including the eggs of the spruce budworm and the caddling moth. Next spring large numbers of the wasp will be released from aircraft in areas of Ontario infested by the spruce budworm.

In a third project, another parasitic wasp is being reared that specifically destroys the larvae of the spotted tentiform leafminer. The leafminer attacks apple orchards and destroys apple crops.

The rearing of large numbers of insects of certain species in the laboratory is not a simple task. The various species all require different climatic conditions, different foods and a specific environment for optimum growth.

To assure these conditions, and to prevent the uncontrolled escape of some of the reared insects, the laboratory has been provided with a number of features.

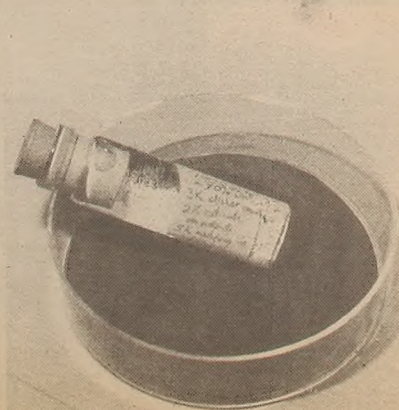
The specialized rooms include the only non-governmental quarantine room designed to hold imported insects in quarantine, growth rooms for mass production of insects, a greenhouse for the rearing of host plants, a media room for the preparation of insect diets, an autoclave for equipment sterilization, rooms for the irradiation of insects, coolers, environmental chambers, and similar facilities.

The temperature and light in all rooms can be closely controlled to suit individual insect species and their various life-forms — larvae, maggots and adult insects.

The building also contains a large laboratory for biological studies on insect pests and their natural enemies.

Preliminary studies in biological pest control at the University of Guelph were financed by Environment Ontario grants covering operating costs. The ministry will continue with a contribution of \$237,000 for the 1982 operating costs.

Construction of the laboratory was financed by a contribution of \$460,000 from the Ontario Ministry of Agriculture and Food and by the University of Guelph.



The small vial contains 15,000 eggs that will eventually grow into pest fighters.

(photos: Robert Kocil)



# Fighting Island up for rehabilitation

A provisional certificate of approval has been issued to the City of Detroit and its consultant Snell Environmental Group for a pilot study designed to determine the feasibility of rehabilitating Fighting Island's soil to support vegetation, Doug McTavish, Environment Ontario's southwestern regional director, announced.

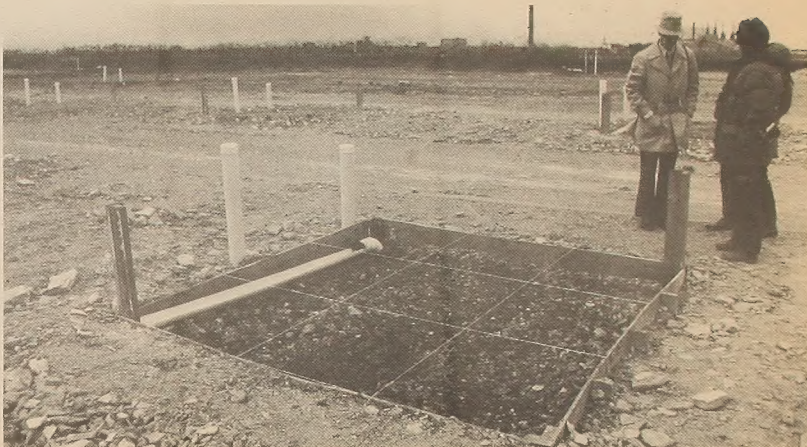
Any possible full-scale rehabilitation proposal will be subject to the Environmental Assessment Act," said Mr. McTavish.

Fighting Island lies in the Detroit River southwest of Windsor. The island is part of Sandwich West Township and has been used by B.A.S.F. Wyandotte Co. Ltd. of Michigan for the disposal of industrial waste since the mid-1920s.

The pilot research project will involve transportation of about 600 wet tons of sewage sludge from Detroit. The sludge will be mixed with the industrial waste in a one-hectare area on the 478-hectare island. Different vegetation species will then be planted and data will be collected over a 72-week period.

In the one-hectare area, 48 test cells, each about 8 feet square, have been constructed to test different mix ratios, modes of surface preparation and plantings of different vegetation species.

Should the test project be suc-



Sludge is being mixed in different ratios with industrial waste in the cells established on Fighting Island to determine the best ratio for plant growth.

(photo: Robert Kici)

cessful, sludge could be spread over parts of the island where industrial waste has been placed and vegetation would be planted. The vegetation would stabilize the in-

dustrial waste and prevent it from blowing over the area. Proper vegetation would be esthetically more pleasing and allow the redevelopment of the area for recrea-

tional facilities.

Progress of the tests will be monitored by Environment Ontario and a citizens advisory group being formed by the Township of

Sandwich West. Data from the pilot-scale study could assist a future environmental assessment study should full-scale rehabilitation be proposed.

# Old tires help bacteria compost sludge

Of all the solid waste our society produces, old tires are probably the material that causes most problems in disposal.

Buried tires wander through landfill sites and pop up, sometimes years after their burial. Burning this produces an intense, air-polluting smoke.

Only a small part of discarded tires find some re-use as bumpers in harbors, explosion-dampening mats in mining and through special reprocessing facilities operated by a few rubber manufacturers.

During the past year, the City of Windsor has found a new way to

re-use old car and truck tires. At the city's pollution control plant, shredded tires are mixed with sewage sludge. In the mixture, the practically inert rubber helps air to circulate in the mass and allows aerobic bacteria to transform the sludge into good quality compost.

The compost is spread over the clay cap of a phased-out landfill site and will eventually help to transform the site into a landscaped recreational park.

The West Windsor sewage treatment plant serves a population of about 100,000 and produces about 25 tons of sewage sludge a

day. In the past, some 30,000 cubic yards of woodchips were used yearly to help in the aeration of the sludge. In the process, the woodchips were also composted.

When the price of chips rose in 1980 to over \$10 a cubic yard, the city looked for a suitable cheaper substitute. It was found in shredded old tires.

The shredded tires replace only about half of the amount of woodchips used. But they are not affected by the process, can be screened out of the compost and are used again and again.

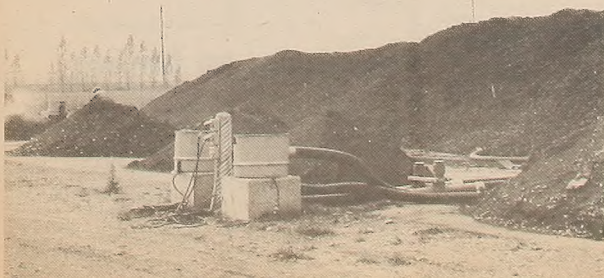
In the process, dewatered sludge is mixed with woodchips and shredded rubber and piled up in a paved area of the plant reserved for the purpose. Leachate from the material is collected and returned to the sewage treatment plant. The mixture is covered with 12 to 18 inches of screened compost to keep composting heat at about 55°C.

After 28 days composting is completed and the material is screened to recover the rubber and not fully composted woodchips.

The compost is also tested for moisture and bacteria, metals and nutrients content.

Environment Ontario is financing studies, now under way, designed to determine the value of the compost on agricultural soil.

"We use only about 400 cubic yards of shredded rubber," said John Faust, chemist with the pollution control branch of Windsor's public works department. "This may not be much in relation to the total amount of discarded tires, but if our process proves to be economical and efficient, many municipalities across Canada will follow suit, and this may in the end contribute to a solution of the tire disposal problem."



Blowers circulate a continuous flow of air through heaps of sludge mixed with wood and rubber chips to promote composting and control odor.

(photo: Robert Kici)



Chips of old tires held in the aeration process can be recovered after composting is completed.



# UV light polishes sewage plant effluent



An Environment Ontario technician samples the irradiated effluent at the Burlington sewage treatment plant. (photo: Robert Koel)

Ultraviolet light may replace chlorine in the treatment of sewage treatment plant effluent, according to results of a research project undertaken by Environment Ontario's pollution control branch under the supervision of Peter Bohm and Toni Ho.

In Ontario's sewage treatment plants, chlorine is now used to destroy the bacteria remaining in the plant's effluent. But the dangers of chlorine transport, revealed by the

face of the treated liquid. This limitation was easily overcome by the design of the irradiation equipment.

In all other respects UV irradiation was found to be a simple, easily installed and easily maintained means to "polish" the effluent. It does not require the use of dangerous materials, leaves no residue in the treated liquid and can be installed and operated at a cost comparable to chlorine treatment.

After completion of preliminary research, a portable UV effluent "polishing" system is now being installed by Environment Ontario's wastewater treatment section in eight sewage treatment plants in Toronto and surrounding area.

The purpose of this study is to determine the efficiency of UV irradiation under normal operating

## dangers of chlorine transport

Mississauga derailment in 1980, stimulated research for alternative methods.

Environment Ontario's researchers decided to take a closer look at the application of UV light, used in hospitals and by medical researchers to disinfect air, operating rooms and instruments.

Preliminary small-scale laboratory work has shown that UV radiation can destroy 99.9 per cent of the bacteria found in sewage plant effluent. This means that a normal effluent population of 100,000 bacteria per millilitre could be reduced to 1,000 bacteria per ml or to water suitable for swimming and other recreational use immediately at the sewage plant outflow.

The only problem the preliminary study revealed was that U.V. radiation could not penetrate deeper than 5 cm below the sur-

## UV equipment easy to handle

conditions and to find out what the system's limitations are. For 1982 a full-scale demonstration of the system is planned at the Tillsonburg 2-million-gallon-per-day pollution control plant.

When the study is completed, replacement of the existing chlorination equipment with UV irradiation equipment may be undertaken at other sewage treatment plants in Ontario.

## New pumphouse tests equipment

Construction of an independent pumphouse for research and for the testing of sewage pre-treatment equipment has been completed at Environment Ontario's Brampton experimental sewage treatment plant.

The facility, unique in Canada, can draw 5,000 cubic metres (1 million gallons) per day of untreated sewage and pass it through screens, strainers, swirl concentrators and other similar equipment. The efficiency of the machinery can be measured under a variety of conditions.

In addition, the instrumentation of the unit will also allow the evaluation of flow meters. The

pumping station will be able to control the flow of untreated sewage to one section of the treatment plant.

The unit consists of a simple structure housing a variable-speed pump, flowmeters, controls and a water station. The equipment to be tested can be installed on an 18-square-metre concrete pad unprotected from the elements to simulate actual working conditions.

The pumphouse and concrete pad were built by the Ministry of Government Services. The facility will be operated by Steve Black and Fritz Engels of Environment Ontario's waste water treatment section.

## Toronto drinking water not affected by dredging

Environmental effects of the dredging operations at the mouth of the Don River are localized and do not affect the quality of Toronto's drinking water, Ontario Environment Minister Keith Norton announced.

The announcement is based on the findings of a Ministry investigation of the dredging, disposal of dredged material and lakefilling activities on the Toronto waterfront covering the period August 15 to November 29, 1980.

"The Toronto drinking water supplies continue to be of excellent quality," the Minister said.

Ministry investigators monitored water distributed by the R.C. Harris and Toronto Island filtration plants and found that it complied with Ontario drinking water quality objectives at all times.

In the summer of 1980 the Toronto Harbor Commission began dredging at the mouth of the Don River. This was the first program of its kind at that location since 1975.

The dredged spoils were deposited into an endlake especially created at the Headland for this

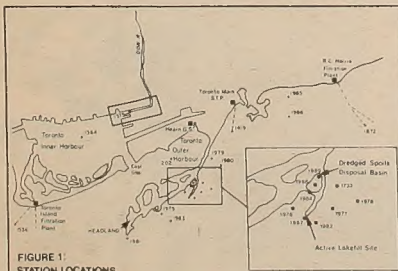


FIGURE 1: STATION LOCATIONS

purpose. The endlake was constructed by lakefilling using excavated trucked fill material.

In 1980 the Ministry began a program designed to measure the effects of dredging, dredged spoils disposal and lakefilling on water quality in the Toronto waterfront. This study involved frequent water quality investigations at the dredge site and around the disposal site, as well as intensive sampling of raw and drinking water at the R.C.

Harris and Toronto Island filtration plants.

In addition, the quality of sediments from the Don River mouth and the trucked fill material was investigated.

A previous Ministry report covering the period May to August, 1980, indicated that these activities did not adversely affect the water. This more recent report reaffirms these findings.

## Charlton: on timing

(continued from pg. 5)

And I hope that this will happen when the new liquid industrial waste site is discussed, too.

"Technical and financial assistance and previous experience in the hearing process has contributed to the smooth and relatively quick hearing process held on the Hyde Park dump site in New York."

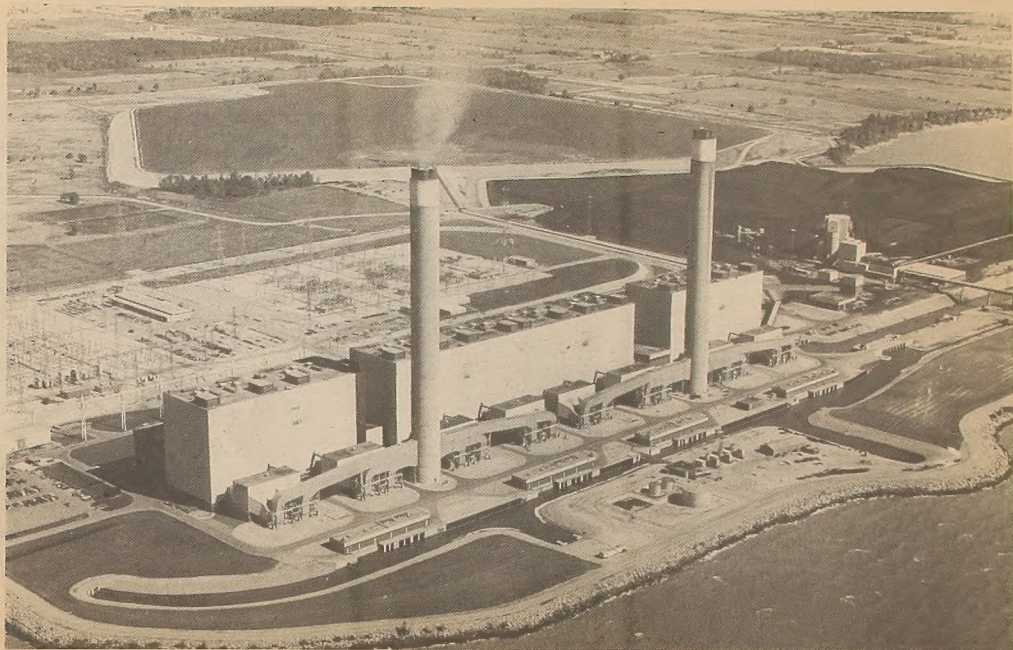
Mr. Charlton is not out to seek publicity for publicity's sake.

"In my dealing with environmental matters I much prefer to voice my concerns to the Minister or his representative before the

subject is brought into the Legislature. If I can then see that some of my party's concerns are reflected in the proposed regulations or in the bills, I feel that I have done my job."

"To stand up in the House and raise hell—that I reserve only for the occasions when all previous efforts to achieve a consideration of our concerns have failed. It happens when I feel that I need the support of as wide as possible a sector of the public to get things done in the public's best interest as I see it."





Ontario Hydro's Nanticoke power generating station. Proper planning reduced pollution of Lake Erie from this and other large plants in the area to a minimum.

(photo: Ontario Hydro)

## Nanticoke development

# Planning keeps effects minimal

The development of a \$2 billion industrial complex in the Nanticoke area has not affected the area's environment, reports on air, water quality and vegetation show.

The reports were presented by environmental scientists and engineers from government and industry at a seminar sponsored jointly by the Nanticoke Environmental Committee and the Nanticoke Environmental Management Program in Simcoe.

The reports also indicated that the preservation of environmental quality was primarily achieved by government and industry co-ordination in the planning and development of this largest enterprise of its kind built in Ontario during the past decade.

All the data showed natural seasonal and short-term fluctuations. The lake temperatures near the outfall of the generating station have increased by more than 2° C above normal, but this localized effect has caused no changes in water quality or living organisms.

The entrainment and subsequent

### plans consider environment

mortality of adult and larval fish in the cooling system of the generating station has not altered the fish community measurably. Because environmental protection measures were incorporated by the industries, the effects of industrial development have been small and local.

Don Gillies, manager, Environmental Protection, Thermal Division, Ontario Hydro, commented on NEMP's co-ordinated government-industry study into the impact of industrial development. He pointed out that the study focused on air quality in the immediate vicinity of the industrial complex — out to 30 kilometres from the shore. Mr. Gillies acknowledged that longer-range effects may occur from emissions leaving this area.

Ron Cameron, superintendent, Air and Water Conservation, for Texaco's Nanticoke refinery, presented the 1980 results of monitoring for a number of substances, such as sulphur dioxide,

ozone and airborne particulate matter. Generally, air quality in the area was found to be good during 1980, the only exception occurring from the presence of ozone.

George Vasiloff, a scientist with Environment Ontario's phytotoxicology section, noted that vegetation damage studies have not shown any local industry-related effects. Only ozone injury symptoms have been observed. This ozone is produced by atmospheric chemical reactions during long-range transport from sources outside the Haldimand-Norfolk region.

Maris Lusis, scientist with Environment Ontario, described some special investigations.

Monitors of acidity in rain have indicated that long-range atmospheric transport is largely responsible for the observed values. Detailed sampling directly beneath the plume of the Nanticoke generating station has shown a

### good buffering capacity

measurable fallout of acid rain constituents, but no adverse effects are expected because of the good buffering capacity of the soil.

Mr. Lusis said that an air quality data telemetry system has been installed at Nanticoke, linking monitoring stations directly to the Environment Ministry computer in Toronto.

The seminar was attended by elected members of the regional municipality of Haldimand-Norfolk, local MPs and MPPs, and representatives of chambers of commerce, agricultural societies, the fishing industry, cottagers associations and conservation groups.

Copies of the papers presented are available from the Information Services Branch, Ontario Ministry of the Environment, 135 St. Clair Avenue West, Toronto, M4V 1P5.

### industrial park of 2,500 acres

The industrial complex in the Long Point area of the Lake Erie shoreline comprises a coal-fired Ontario Hydro generating station, a Texaco Canada oil refinery, Stelco's steel-making facilities and a 2,500-acre industrial park now under active development.

Information on water quality temperature, currents and biota has been collected since 1969 from a network of stations in the lake close to the site of the complex, said Roland Weiler, head of Environment Ontario's near-shore surveillance unit.

## First bibliography on acid rain

A 181-page bibliography listing available scientific literature on the effects of acidic precipitation on terrestrial ecosystems, has been compiled and published by Environment Ontario.

The bibliography will go a long way toward filling the need of the scientific community for a reference document on this important subject, said Dr. S.N. Linzon, supervisor of the ministry's phytotoxicology section and editor of the new reference work.

The bibliography includes literature available to the end of 1980,

and up-dated supplements will be issued from time to time.

The listings in the bibliography are grouped into main divisions, as effects on vegetation and effects on soils, and further subdivided into theme topics listed alphabetically by authors in each subgroup. The content of each listed article is summarized and reviewed. The work was undertaken as part of the ministry's Acidic Precipitation in Ontario Study (APIOS).

Literature on other effects of acid rain, including aquatic effects, is listed in an earlier bibliography published jointly by En-

vironment Canada and Environment Ontario in July, 1980, entitled "A Bibliography: The Long-Range Transport of Air Pollutants and Acidic Precipitation."

The new bibliography of scientific literature on the terrestrial effects of acid rain is available for \$3 at the Ontario Government Bookstore, 880 Bay Street, Toronto. For reference, the bibliography can be consulted at the Public Reading Room, Environment Ontario Library, on the ground floor at 135 St. Clair Ave. West, Toronto, and at all ministry regional and district offices.



# Electron microscope sees atoms

Since 1975, the electron microscopy unit at the Environment Ontario main laboratory in Toronto has been involved with numerous environmental studies. To make potential users aware of the unit's capabilities, a one-day symposium was held at which speakers dealt with the principles of electron microscopy and its many applications.

At the symposium, experts presented papers on the use of the electron microscope in the identification and study of bacteria, virus-related, forensic, geological and geochemical problems. The analytical capabilities of the electron microscope and its automation were also discussed.

\* \* \*

To understand how things function, it is necessary to study them in detail. As minimum detection levels decrease, electron microscopy, a field where very fine detail can be observed, is gaining in importance in the study of environmental pollutants.

The first light microscope was probably built between 1590 and 1610. Two centuries later, refinements to the light microscope were brought about by correction of optical defects in the lenses. Even with these improvements, the resolution of the light microscope was limited by the fundamental nature of light.

Two essential discoveries which led to the building of the electron microscope were the recognition that:

- a moving electron has the properties of light-like waves,
- suitably shaped magnetic or electric fields can act as lenses to focus an electron beam to produce an image.

In 1932 the first transmission electron microscope was described and by 1939 the commercial production of these microscopes began in Germany.

A simple transmission electron microscope consists of an evacuated metal cylinder within which are aligned, one under the other, a tungsten filament (the cathode), a metal plate with a central aperture (the anode), a number of magnetic lenses, a fluorescent viewing screen and a photographic plate. A current passing through the tungsten filament causes it to heat up and emit electrons.

A high negative voltage applied to the filament accelerates the electrons towards the anode. Some of these pass through the central aperture and travel on down the column as an electron beam. The electron beam is focussed by a second magnetic lens, the objective lens.

The image created by the objective lens is magnified further by the imaging lenses and is made visible on the fluorescent screen. The image on this screen can be photographed.

*more than 500,000 times*

One of the greatest difficulties in understanding electron microscopy is the comprehension of its magnification. In the electron microscopy unit of Environment Ontario, asbestos analysis is carried out at 20,000 times magnification. The image of a 25 g piece magnified 20,000 times would have a diameter of 500 metres—the length of five football fields laid end to end.

Most conventional transmission electron microscopes can be used at magnifications of 100,000 times or greater. The magnification of high resolution microscopes ranges upward from 500,000 times.

The SEM, whose resolution is intermediate between that of the



**Daphnia magna**, a frequently found microorganism, magnified 200 times by scanning electron microscopy. Scanning produces images with a depth of field not possible in light microscopy.

optical microscope and the conventional transmission electron microscope, is a valuable addition to the range of microscopes available.

In the SEM, a fine electron beam is focussed onto the surface of a solid specimen. Scanning coils cause the electron spot to be scanned across the specimen surface similar to that on a television screen. The electron beam incident on the specimen surface causes the emission of secondary electrons as well as numerous other signals. These electrons strike a collector and the resulting current is amplified and used to create an image on the cathode ray tube. Due to its large depth of focus, the SEM can be used to examine bulk specimens and reveal surface topographical features in three dimensions.

## analyses of structures

In all electron microscopes, a wide range of characteristic specimen-related signals is produced when a focussed electron beam impinges on a specimen surface. All these signals can be collected simultaneously in a single instrument to permit a high resolution analysis of the structure and composition of the specimen.

Images created in the microscope can be simulated by a computer and from this dimensional information can be extracted. Computers have become an in-

tegral part of analytical electron microscopes and can be programmed to control the operations of the microscope as well as provide compositional and chemical information about the sample.

Over the past few years, improvements in electron microscopes, both in their resolution and

The distribution of sulphur in human hair has provided valuable information about air pollution. Air particulates have also been related to their sources of emission by electron microscopy.

Materials characterization ranges from analysis of geological samples and crystalline structures to particulate evaluation. The SEM has also become a principal analytical tool of the microcircuit industry, particularly in the analysis of failure mechanisms in today's solid state components.

Forensic science applications of electron microscopy have been applied in cases such as physical matching of broken surfaces and identification of gunshot residues.

The variety of applications of electron microscopy is constantly

## sulphur in hair reveals pollutants

the amount of data that can be extracted from the resulting images, have made these instruments an indispensable tool and have greatly extended their usefulness in chemical research. Electron microscopes can now be built to yield reliable images with resolution at virtually atomic levels.

Electron microscopes now widely distributed throughout the world have contributed to developments in biology, medicine, physics and material science.

In biology and medicine, cellular ultrastructure has been studied intensively. Various microorganisms such as bacteria, protozoa and viruses have been examined and our knowledge of the interaction of these pathogens with the host cell has been expanded. Even more information has been obtained using radioautography or immunoelectron microscopy in which antibody markers are used, for example, to detect and localize viral antigens in infected cells.

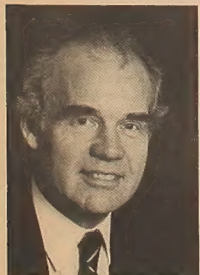
## wide variety of applications

expanding as new achievements and technical advances are made.

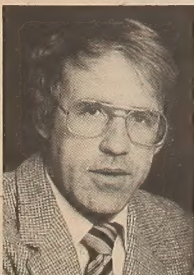
Information regarding the symposium organized by Environment Ontario may be obtained from:

Darke Mijus  
Project Scientist  
Water Quality Section  
Laboratory Services Branch  
125 Resources Road  
Rexdale, Ontario  
M9W 5L1  
(416) 248-3512

## Executive appointments



Peter J. Crabtree



Tom D. Armstrong

(photo: Terry Buchanan)

Environment Ontario's Deputy Minister, Gerard J.M. Raymond, announced the following senior appointments effective January 1, 1982.

Peter J. Crabtree as Co-ordinator of Environment Ontario's Niagara River Improvement Team.

Tom D. Armstrong as Co-ordinator of the Ministry's Waste Disposal Site Program.

Mr. Crabtree is moving from the position of Executive Administrator of the Waste Management Advisory Board. He will be based at the West Central Regional office in Hamilton.

Mr. Armstrong is leaving Central Region, where he has been Manager, Industrial Abatement. He will operate from 135 St. Clair Ave. W., Toronto.